Chapter-1

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1.1 Solid Waste Management in Urban Local Bodies

Wastes are materials that the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose. Wastes are generally classified into municipal solid waste (MSW), bio-medical waste (BMW), construction and demolition (C&D) waste, e-waste, plastic waste, slaughterhouse waste, industrial waste and hazardous waste by virtue of their nature. They are also classified as biodegradable, non-biodegradable, combustible, dry and inert based on their characteristics.

Municipal solid waste management (MSWM) in urban areas has emerged as one of the biggest challenges. The situation is aggravated by rapid urbanisation. Although MSWM is an essential service and a mandatory function of municipal authorities across the country, it is still being managed inefficiently resulting in significant negative externalities in terms of public health and environmental outcomes. Besides, it has an adverse impact on the aesthetic appearance of the surroundings.

1.2 Hierarchy and Process of waste management

Solid waste management covers hierarchy of– 5Rs (Reduce, Reuse, Recycle, Recover and Remove).

Reduce: The first choice of measures in waste management is avoidance and waste reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

Reuse: Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

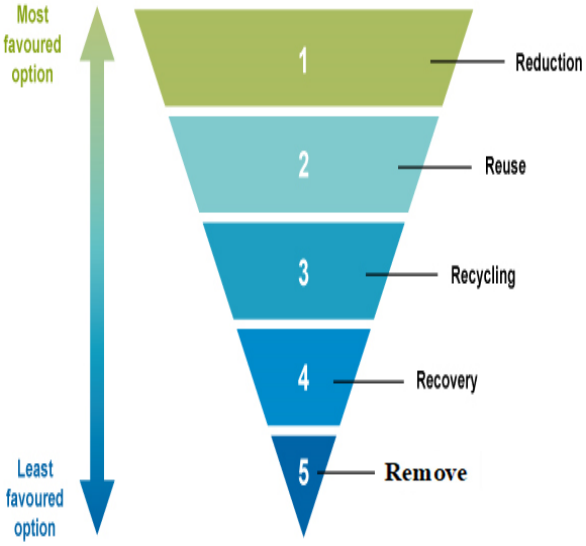


Chart-1.1: The Hierarchy and Process of waste management

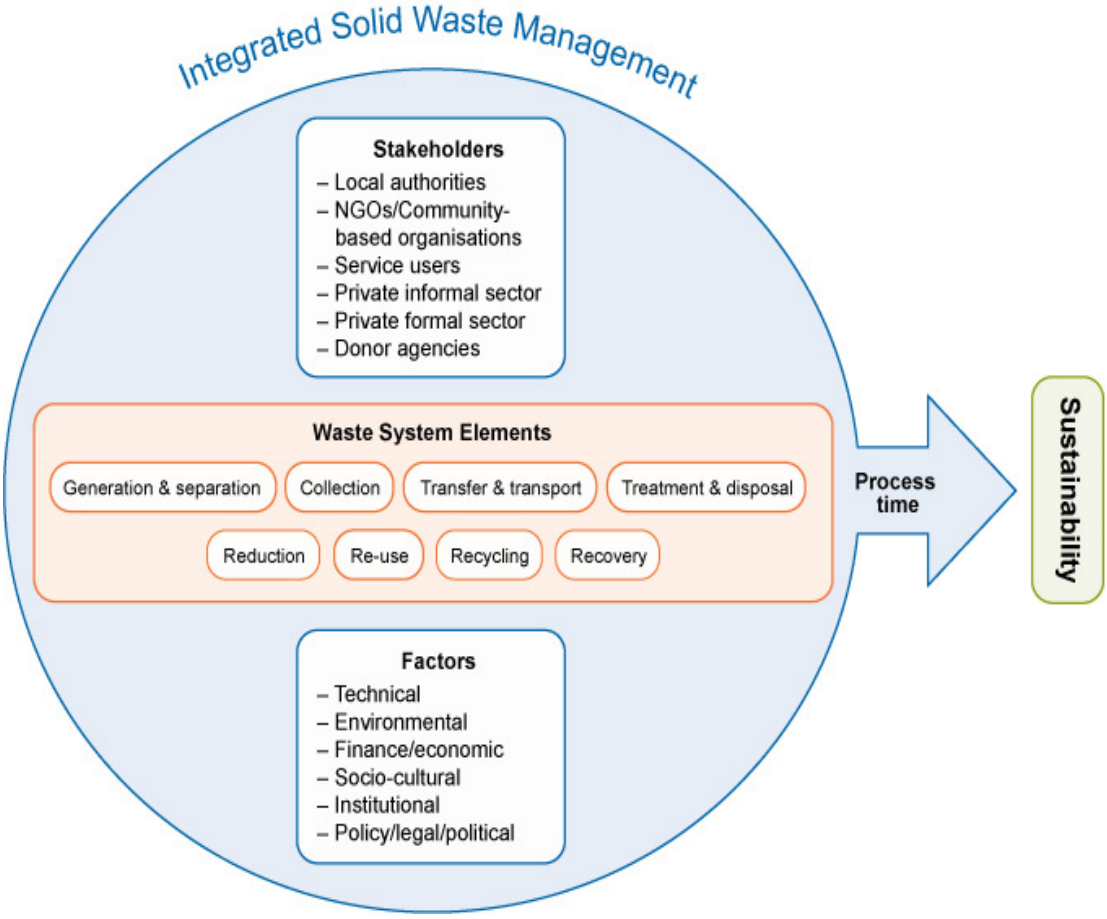
Recycle: Recycling is process of transforming materials into secondary resources for manufacturing new products. Promotion of waste recycling sector and providing it with an institutional support can motivate all the stakeholders to segregate at source of generation. The recycling of waste involves separating articles from the waste stream and processing them as products or raw materials. This approach seeks to recycle a product when it reaches the end of its life span.

Recover: Recovery involves reclaiming components or materials or using the waste as a fuel. Material recovery involves a variety of mechanical or biological processes that remove a variety of materials from the waste stream.

Remove: Remove refers to residuals management or the management of materials which remain after the previous 4Rs have been applied. The last step of the waste management is wherein the quantity of waste cannot be reduced during production. The purpose of implementing the waste management hierarchy is to use waste as a resource and divert these potential resources from dumpsites/landfill.

The integrated process of solid waste management is depicted in **Chart-1.2** below:

Chart-1.2: Integrated Solid Waste Management



Processing Technologies

Integrated solid waste management (ISWM) plants typically have pre-processing facilities to separate organics from recyclables and other high calorific waste. The organic waste is usually composted aerobically to produce manure or processed anaerobically (in absence of air) for production of energy. Recyclables are separated and sent to wholesalers for further supply to recycling facilities. High calorific wastes are then baled or processed and can be used as fuel or co-processed in cement plants. The processing technologies are detailed in ***Appendix-1.1***.

1.3 Regulatory framework governing Management of Waste

The Solid waste management (SWM) rules 2016, provides a legal framework for disposal and management of solid waste and entrusts responsibilities at State level and Urban Local Bodies (ULBs) level. Apart from above, the Constitution (seventy fourth amendment) Act 1992, which came into effect on 1 June 1993, provided a constitutional status to Urban Local Bodies. Article 243 w of the Constitution of India provides that the legislature of the state may by law endow the municipalities with such powers and authority as may be necessary to enable them to function as institutions of self-governance. The twelfth schedule of the Constitution enumerates 18 specific functions to be devolved to Urban Local Bodies**.** The State Government devolved the function "Solid Waste Management" to the Urban Local Bodies.

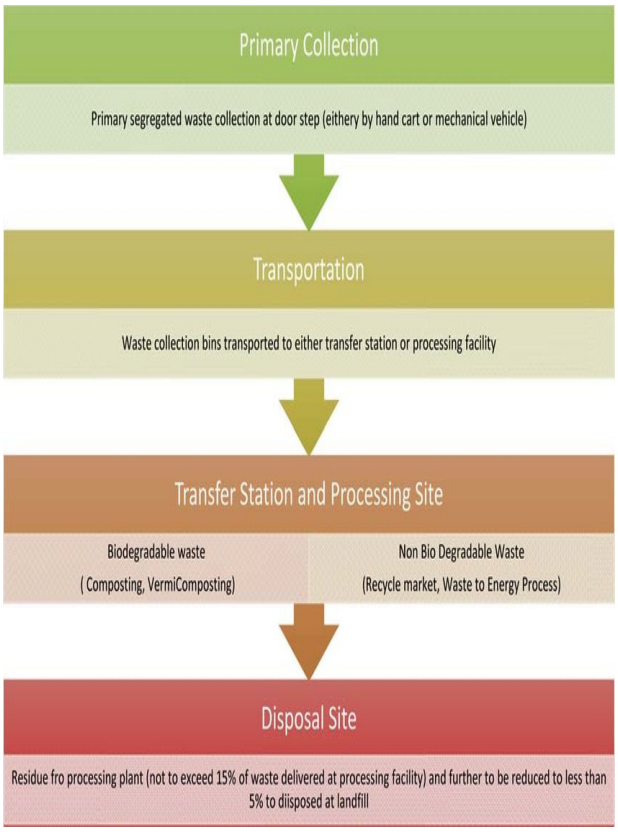
The solid waste management rules 2016, places certain duties and responsibilities on the generators of waste.

(i) Waste generators are responsible for segregating and storing waste in three separate streams - biodegradable or wet waste, non-biodegradable or dry waste and domestic hazardous wastes (DHW), to be handed over to waste collectors.

(ii) Waste generators are not allowed to burn, bury or throw waste in street drains and water bodies.

(iii) All resident welfare associations, gated communities and institutions with more than 5,000 sq. meter area and market associations are required to ensure segregation of waste at source in biodegradable and non-biodegradable and treat bio-degradable waste through decentralized treatment process within their facility as far as possible.

Chart-1.3: Flow Chart of Municipal Solid Waste Management Chain



(iv) Construction and demolition waste are to be stored separately and disposed in accordance with construction and demolition waste management Rules 2016.

(v) Biodegradables are to be processed through composting/ bio-methanation, while residual are to be handed over separately.

1.4 Municipal Solid Waste in Uttarakhand

As per the annual reports of Uttarakhand Pollution Control Board (UKPCB) the MSW generated, collected and processed by the ULBs during the years 2017-18 to 2021-22 in the State is depicted in **Table-1.1**:

Table-1.1: Municipal solid waste generated, collected & treated by the ULBs

Solid Waste Ton per Day (TPD)	2017-18	2018-19	2019-20	2020-21	2021-22
Generated in the State	1,099.00	1,527.46	1,610.94	1,458.46	1,585.39
Collected in the State	1,099.00	1,437.40	1,481.06	1,378.99	1,451.59
***Percentage* of waste collection in comparison to generation**	***100***	***94***	***92***	***95***	***92***
Treated in the State	Nil	524.00	716.64	779.85	1,050.00
***Percentage* of waste treated in comparison to collection**	***Nil***	***36***	***48***	***57***	***72***

Source: Annual Reports of UKPCB.

As evident from above, on an average 95 *per cent* of the waste was collected and 43 *per cent* was processed during the years 2017-18 to 2021-22 and a major portion of the remaining MSW was dumped at landfills/dumping grounds which would have a harmful impact on health and environment.

1.4.1 Administrative control and monitoring of Solid Waste Management

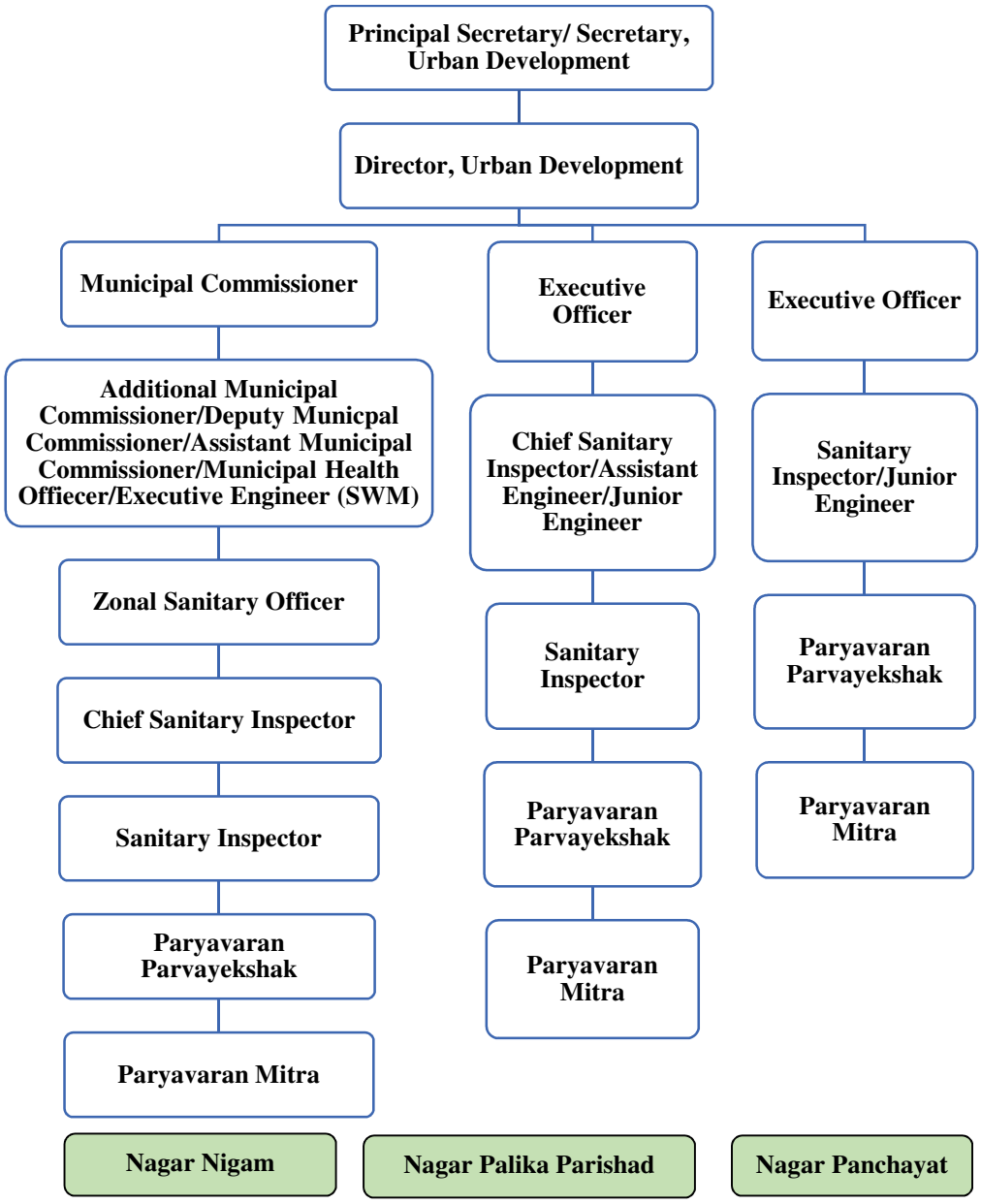
The role of various authorities at all levels in planning, execution and monitoring of municipal solid waste management is depicted in the **Table-1.2** below:

Table-1.2: Roles of Authorities

Level	*Planning, Execution and Monitoring*	*Authority*	*Role of Authorities*
State	*Policy framing, Monitoring & Evaluation*	*Urban Development Department*	• *Framing policies & draft Action-Plans, Handholding of ULBs in preparation of Detailed Project Reports (DPRs), Request for Proposals (RFPs) & other statutory compliances related to SWM Projects*
		Uttarakhand Pollution Control Board	• *Authorisation to the operator of a facility or urban local authority, or any other agency responsible.* • *Enforcement of SWM Rules in the State through local bodies in their respective jurisdiction and review implementation of these rules in close coordination with Directorate or Secretary-in-charge of State Urban Development Department.* • *Monitor environmental standards and adherence to conditions as specified under the Schedule-I and Schedule-II for waste processing and disposal sites.*
District	*Implementation*	*Urban Local Bodies- Nagar Nigam, Nagar Palika Parishads and Nagar Panchayats*	
	Monitoring & Evaluation	*Regional Pollution Control Offices*	

1.4.2 Organisational set up

The Organisational Set-up of Solid Waste management is given in the Chart below:



Uttarakhand Pollution Control Board (UKPCB) has been entrusted with the responsibility of enforcing Acts and Rules of municipal solid waste. The Member Secretary, UKPCB at State level and four Regional Officers at regional level are responsible for enforcing/reviewing the implementation of SWM Rules 2016 at ULBs level.

1.5 Funding for Urban Local Bodies

The sustainable financing is paramount to ensure discharge of any function. The management of solid waste can be carried out effectively by the ULBs only when they are supported with sufficient financial resources.

1.5.1 Sources of funds

The ULBs execute MSWM activities using grants released by the Central and State Governments, as well as revenue from their own sources. Paragraph 1.4.5.6.2 of the SWM 2016 manual states that SWM services must be financially viable on a stand-alone basis for sustainability. Therefore, assessing financial viability is crucial in SWM planning. Following the recommendations of the 15th Central Finance Commission, grants (Tied-(60 *per cent*) and Untied-(40 *per cent*)) needs to be allocated to Local Bodies for cities with populations less than a million. Tied Grants are distributed for Drinking Water (50 *per cent*), including rainwater harvesting and recycling, and Solid Waste Management (50 *per cent*). The various source of funds received by the ULBs for management of solid waste are indicated in the **Table-1.3** below:

Table-1.3: Sources of finance in ULBs for waste management

Sl. No.	Source	Particulars
1	**Central Grants**	• 14th Finance Commission • 15th Finance Commission • Swachh Bharat Mission • Special Assistance to States for Capital Investment
2	**State Grants**	• State Finance Commission
3	**Own Resources (Municipal Fund)**	• SWM user charges, • Sale of products and by-products (compost, *etc*.), • Sale of recyclables • Penalties

Source: Information provided by the Department.

1.5.2 Expenditure on SWM against total available funds

Rule 15(x) of the SWM Rules 2016 mandates Urban Local Bodies (ULBs) to allocate sufficient funds in their annual budget for capital investment, as well as for the operation and maintenance of Solid Waste Management (SWM) services. This requirement ensures that funds for discretionary functions of local bodies are allocated only after fulfilling the necessary funding requirements for SWM and other obligatory functions. The details of total expenditure incurred on solid waste management vis-à-vis total expenditure against total available fund of the test checked ULBs is shown in the **Table-1.4** below:

Table-1.4: Details of expenditure under SWM of test checked ULBs

(₹ in crore)

Year	Total available fund	Total Expenditure	Expenditure on SWM	Percentage of expenditure on SWM over Total expenditure
2017-18	434.91	298.15	111.09	***37.26***
2018-19	538.64	329.25	128.54	***39.04***
2019-20	650.47	334.59	144.89	***43.30***
2020-21	783.46	471.20	174.68	***37.07***
2021-22	744.58	528.04	192.68	***36.48***
Total		**1,961.23**	**751.88**	***38.34***

Source: Information provided by the test checked ULBs.

The table shows that the expenses on solid waste management activities accounted for 38.34 *per cent* of total expenditures between 2017 and 2022, among the sampled ULBs. The details of total allotment and expenditure incurred from various sources during the period 2017-18 to 2021-22 by the test checked ULBs is given in ***Appendix 1.2***.

1.6 Audit Framework

1.6.1 Audit Objectives

This performance audit was conducted to assess whether:

- "Strategy and Planning" of solid waste management in ULBs was effective in dealing with the wastes generated and concurrent with the prevailing legal framework;
- Municipal tasks associated with solid waste management including collection, segregation, storage, transportation, and disposal were effective, efficient and economical;
- Planning, construction, commissioning, operation and maintenance of solid waste management projects in ULBs was effective, efficient and financially sustainable;
- Monitoring and evaluation of solid waste management system were adequate and effective.

1.6.2 Scope and Methodology of Audit

The performance audit covered management of municipal solid waste for the period 2017-18 to 2021-22. Audit collected data and information available with the Urban Development Directorate, Urban Local Bodies (ULBs) and Uttarakhand Pollution Control Board (UKPCB). Joint physical inspection of solid waste management sites was also conducted along with the officials of ULBs.

An entry conference with the Additional Chief Secretary, Urban Development Department (UDD) was held on 12 October 2022 in which the audit objectives, criteria, scope and methodology were discussed. An exit conference to discuss the draft observations was held on 06 September 2023 with Additional Secretary, UDD and Member Secretary, UKPCB. The views expressed by the concerned officers during the exit conference have been included, wherever necessary.

1.6.3 Audit Criteria

The criteria for evaluating the performance of SWM was derived mainly from:

- Manual of municipal solid waste management, 2016.
- The solid waste (Management and Handling) rules, 2016.
- Construction and demolition waste management rules, 2016.
- Performance parameters set out in service level benchmarking (SLB) guidelines; and
- Uttarakhand Pollution Control Board (UKPCB) guidelines.

1.6.4 Sampling

The waste is managed in the State by 102 ULBs (nine Nagar Nigams, 42 Nagar Palika Parishads and 51 Nagar Panchayats). In each tier of ULBs (Nagar Nigams, Nagar Palika Parishads and Nagar Panchayats)- two Nagar Nigams, 10 *per cent* Nagar Palika Parishads and five *per cent* Pagar Panchayats from each region had been selected. The audit units were selected by applying simple random sampling (region wise) using IDEA application software.

Apart from above, one Nagar Palika Parishad and one Nagar Panchayat of char dham route were also selected to check the management of solid waste in these areas. Further, apart from ULBs, Regional Offices of UKPCB of both the regions had also been selected. Overall, 17 units, 13 ULBs[1] and four regional offices[2] of State Pollution Control Board were selected for performance audit. Selected ULBs are depicted in the map below:

Photo-1.1: Map of Selected ULBs

1.7 Acknowledgement

Audit acknowledges the cooperation of the Government of Uttarakhand (GoU), Member Secretary, Uttarakhand Pollution Control Board and appreciates the assistance provided by the field functionaries of these departments for smooth conduct of the audit.

[1] Four Nagar Nigams: Dehradun, Haridwar, Haldwani & Rudrapur; Five Nagar Palika Parishads: Mussoorie, Khatima, Barkot, Nainital & New Tehri; Four Nagar Panchayats: Dineshpur, Naugaon, Swargashram Jonk & Augustmuni.

[2] Dehradun, Roorkee, Haldwani & Kashipur.

1.8 Structure of the report

This performance audit report has been structured keeping in mind the major components of solid waste management i.e. collection, segregation, transportation, storage and disposal of waste, human resources, functioning of regulatory bodies in respect of relevant acts and rules.

Audit findings relating to the deficiencies and gaps noticed in the test-checked Urban Local Bodies have been discussed in detail in the respective chapters.